

Assembly instructions for LIGNATUR surface element (LFE)



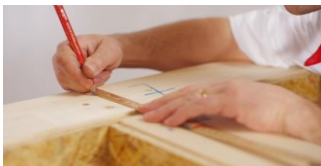
Assembly preparation

- Prepare a level and clean storage space for the unloading of the elements.
- The packages are packed with PE stretch foil to protect against dirt.
- Load on the truck and package numbers correspond to the assembly order.



- To protect the visible surface, the bottom element in the package is inverted. Use edge protectors when unloading the packages and protect tongues and grooves against damage caused by straps.

- Unload by crane over the roof or with forklift from the side of the truck
- Elements must not be rotated on the truck or platform.
- Caution: the visible side of elements filled with chippings in the factory faces downwards
- Study the installation diagram in advance. It defines the order of assembly, tongue side, connection details, cut-outs, framing, preparations for installations, fasteners, interfaces.
- Ordered additional material and assembly suspensions are in package no. 1.



- Measure the ceiling, position of first element and mark the grid dimension.

- According to occupational health and safety regulations, protection against falling must be provided.
- Use tarpaulins to store the packages on the building site. The foil is not a weather protection.



- The Lignatur packaging films are polyethylene (PE). The packaging is to be disposed of as waste type film at the recycling yard. With professional recycling, film waste can be reprocessed and used for new production.

Unloading the LIGNATUR packages

- Edge protectors must be used when unloading so that the straps do not damage tongues and grooves.
- For this purpose, the "LIGNATUR Edge Protector" consisting of 2 protective boards and 4 steel brackets can be ordered from Lignatur AG at extra cost or alternatively you can manufacture edge protectors yourself.



steel bracket



protective board

Procedure for unload packages with a crane



- Push the protective board and crane strap between the packages.



- "fish" the straps from above with a hook and pull them out.



- Set the steel brackets in place and pull the straps tight.



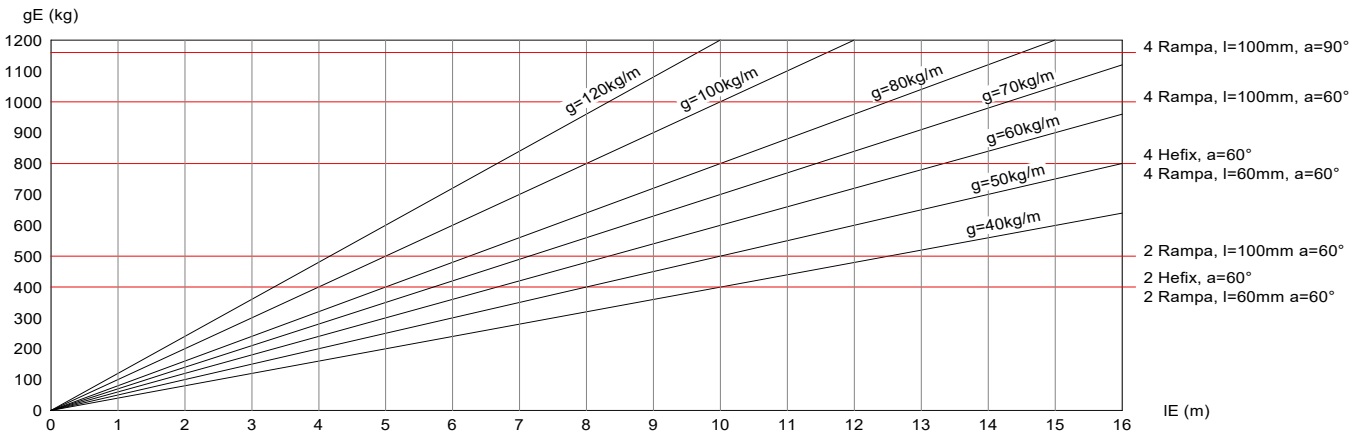
- Fasten the straps to the crane suspension gear and lift the package.



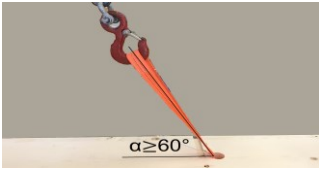
- For transport reasons, factory-fitted lifting straps may be required. Please note: Only use lifting straps once; unloading is the responsibility of the crane operator.

Assembly suspension LFE

- Check which assembly suspensions have been prepared (Hefix lifting straps, Rampa sleeves with lifting loop or lifting anchor with universal head coupling).
- The company that complete the assembly is responsible for selecting and checking the appropriate assembly suspensions.
- 2 suspensions are mandatory. 3 can be useful for asymmetric elements. 4 suspensions necessitate the use of balancing suspension gear or a cross beam. The number must be defined depending on the dead weight of the element.



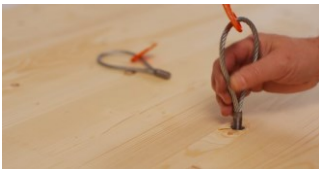
IE = element length (m), g = element weight (kg/m), gE = element weight (kg)



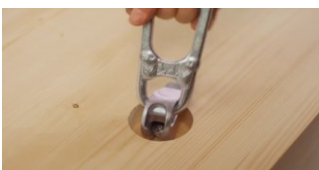
- The spreading angle $\alpha \geq 60^\circ$ between suspension and element must be complied with



- Hole diameter 40 mm in chamber centre with Hefix lifting straps for elements ≤ 800 kg and void height ≥ 90 mm.



- Rampa sleeves with lifting loop (do not use eye nuts in combination with Rampa sleeves) for heavy elements $\leq 1,000$ kg that are insulated and filled with chippings.



- Lifting anchor with universal head coupling (maximum 680 kg per lifting anchor, spreading angle $\alpha = 90^\circ$) for very heavy elements.



- The visible side of the lowest element in the package faces upwards for protection. The two holes in the web are for turning the element with Hefix lifting straps. Only turn the element on squared timbers on the floor and use edge protectors when doing so. In case of assembly directly from the truck, the element must not be turned on the truck.



- **STOP!** It is forbidden to use the holes in the middle of the web for assembly suspensions; they are not dimensioned for this and are only used to turn the lowest element.

Assembly and fastening LFE

- Position the first element precisely and screw it constructively through the middle three webs to the bearings.
- Recommended screws for constructive connection to the timber bearings: Countersunk head wood screw \varnothing 8 mm, l = element height (h) + structurally necessary thread length in the bearing.
- As a rule, the assembly begins with the groove side (groove to the outside).



- Position the next element aligned to the spacing incl. joint, but do not push together (keep to the grid dimension according to the installation plan). The joint allows the free swelling and shrinkage of the elements. After assembly, remove the spacing blocks corresponding to the joint that served as assembly aids. Check the spacing continuously.

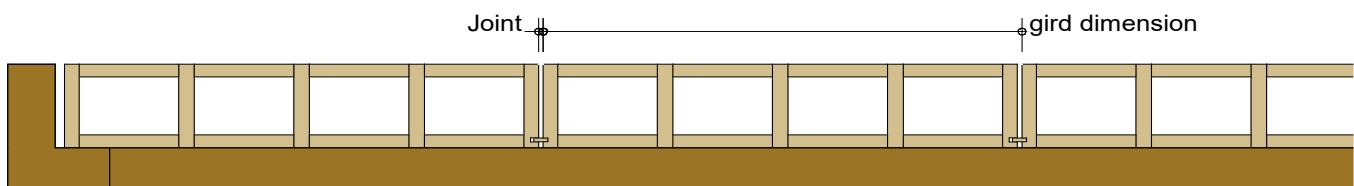


- Pushing up to the joint can be done by hand with light elements. For heavier elements, use screw clamps or a clamping set and the suspension brackets delivered with the order (no conventional beam puller). If possible, do not use a sledgehammer (mallet), or if so, then only with an extra layer.

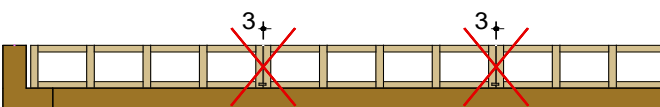


- In order to ensure swelling and shrinkage of the solid wood elements and to minimise shrinkage cracks in the bearing area, the constructive screw connection of the 4-chamber elements (1000 mm wide) should be done through the middle 3 webs and that of the 2-chamber elements (514 mm wide) through the middle web and the web on the tongue side.

- In order to ensure swelling and shrinkage of the elements, they must not be screwed together in the joint.
- To prevent dirt from getting into the joint, cover it with adhesive tape.
- Structural fastenings, for example for connecting the ceiling, implemented as a static plate according to the installation diagram or the structural engineer's specifications.
- The elements must always be kept in position constructively, especially when placed on a steel beam, for example.



- Install the LIGNATUR surface element according to the installation diagram on the grid dimension with joint.



- Do **not** push the elements together!

Shear connector



- Shear connectors are used for the implementation of a planned static plate with surface elements or to align them; especially helpful for acoustic mirrors mounted on the underside.



- If flat steels are planned, insert the flat steel immediately into the prepared groove at least in the middle of the element or close to both element ends during the installation of the elements.



- The fixing with the pan head screw $\varnothing 6$ mm, $l = 60$ mm in the web is only to secure the position and has no structural function. Following the installation of the entire ceiling, set and fix the remaining flat steels.

Fire protection

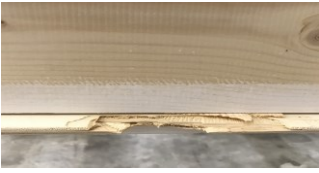


- For fire protection requirements EI 30, 60 or 90 for the LIGNATUR surface elements, joint insulation is clamped to the web over the tongue in the factory on request. The joint insulation corresponds at least to the fire behaviour class A2-s1, d0.

- Interfaces to the bearing and installations must be implemented in accordance with the installation diagram or the structural engineer's specifications.

Aesthetics

- Shell construction is the finished construction – the timber builder is aware of the topic, can deal with it and works carefully and cleanly in his own interests.



- If the tongue gets damaged. No problems. A replacement tongue is include. The exchange takes place without much effort.



- Next to the damaged site, saw in tongue. Take care with visible surface.



- Remove the broken tongue and clean the groove.



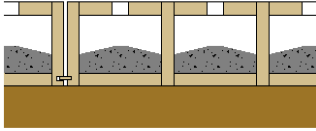
- Cut the supplied replacement tongue to size, apply some glue and install.



- Glaze containers are supplied for small repairs to glazed surfaces.

- Draw the attention of subsequent workers on the building site to the visible ceiling and instruct them not to soil it during their work.

Acoustic insulation: LFE filling (chippings or silence 12)



- LFE filling chippings on site:
Limestone chippings filling material: FERMACELL honeycomb filling 1500 kg/m³, grain size 1 to 4 mm, one 22.5 kg sack. The filling quantity specified on the installation diagram is decisive.



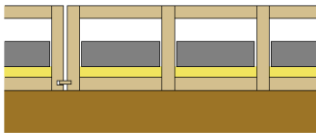
- In each case, check where pallets with chippings may be set down from a structural point of view.
- Distribute the sacks with chippings.
- Tape off joints, to prevent chippings running into them.



- Cut open and empty the sacks with chippings.



- Sweep the chippings with the broom into the slots prepared according to the order (43 mm x 500 mm).
- Depending on the filling quantity, tamp with a wooden block in the cavities if necessary. With regard to acoustic insulation, it does not matter whether the filling is evenly distributed in the cavity.



- LFE silence12 are filled with damper stones in the factory.



- A custom-fit moulding can be supplied to close the slots.



- The moulding is secured with a clip in the slope to prevent it from slipping.

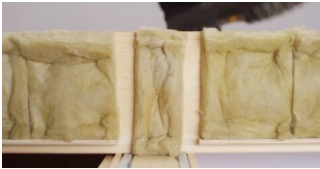
- Constructive couplings greatly worsen the acoustic insulation of the building – do not use spray foam. Implement acoustic insulation decouplings according to the building physicist's specifications.

Thermal insulation, air seal

Insulated, rear-ventilated pitched roof



- Thermally insulating elements are insulated in the factory; the air seal is pre-mounted over the tongues if ordered. The lower slat serves as the vapour barrier. Preparations for installations such as installation ducts are not airtight. The openings on the surface must be hermetically sealed on site.



- If planned, the tongues on the bearing are interrupted and the grooves are filled up with glue.

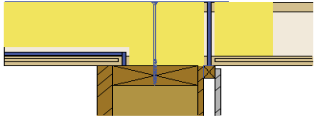


- After installing and fastening the element, peel the white protective tape off the air seal and connect the ends of the airtight sealing cord to the on-site air seal. Bring the next element so close to the previous one that contact with the airtight sealing cord is established. Then bring into the right position and fasten.



- The airtight sealing cord is not pre-mounted on the lowest element in the package. The cord would slip under the tongue during storage
 1: The cord is therefore supplied loose and must be applied on site.
 2: Caution, visible side: First place the element in an upright position for application.

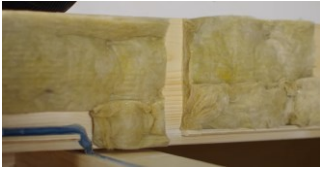
Ceiling projecting beyond the exterior wall – cold underneath, warm on top



- Projecting, thermally insulating ceilings are factory insulated; wind sealing tapes are pre-mounted over the tongue if ordered.



- In preparation for the wind seal, fix the wind sealing tape to the exterior wall.



- Over the exterior wall between exterior and interior, the tongue is interrupted in the factory, the groove filled and joint insulation fitted.

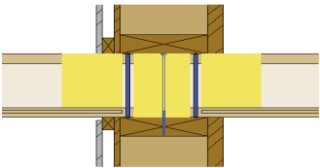


- Position and fix the element.
Peel the white protective tape off the wind seal and connect the wind seal to the wind seal of the wall.

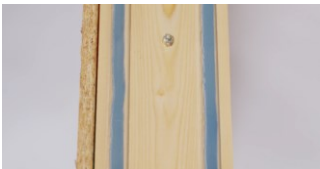


- Fix the vertical air seal to the element on site and connect it to the air seal of the wall later. Bring the next element so close to the previous one that contact with the air and wind sealing tape is established. Then bring into the right position and fasten.

Ceiling projecting beyond the exterior wall – cold underneath, cold on top



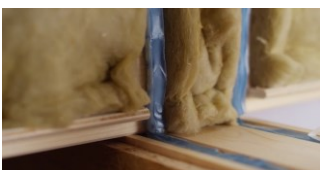
- Projecting ceilings are factory-insulated above the outer wall.



- In preparation for the air and wind seal, fix the air and wind sealing tape to the exterior wall.



- Over the exterior wall between exterior and interior, the tongue is interrupted in the factory, the groove filled and joint insulation fitted. Position and fix the element.



- Fix the vertical air and wind seal to the element on site and connect it to the air and wind seal of the wall. Bring the next element so close to the previous one that contact with the air and wind sealing tape is established. Then bring into the right position and fasten.

Joint filler



- The installation diagram shows where the joint filler is installed. We also recommend using joint fillers in case of the subsequent installation of interior walls. The filler is then inserted into the joint before the wall is placed.



- Clamp the joint filler in the middle of the bearing under the tongue.



- Push the next element against it. The joint filler closes the cavity under the tongue and is used with continuous surface elements on interior walls.

Breakthroughs

Installation ducts, breakthroughs with diameter ≤ 200 mm



- Installation ducts can be implemented differently depending on the required size. Installation slats are suitable for smaller ducts and hollowed-out cavities for larger ducts.



- Simple breakthroughs up to a diameter of 200 mm are structurally unproblematic in the area of the cavity near the bearing.

Breakthrough with diameter ≤ 600 mm, ROR framing



- Breakthroughs, shown here with a diameter of 600 mm, require an appropriate reinforcement and framing, which is prepared in the factory.



- 1. Position the element with prepared breakthrough. Steel pipes, ideally inserted on the longer side so that the short-er end protrudes.

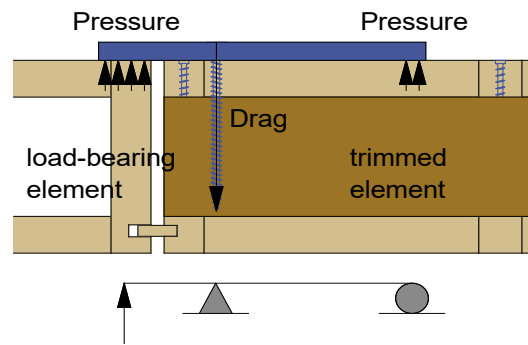


- Place the connecting element on the steel pipe and slide it up to the joint.

Framing with trimmer and steel plates



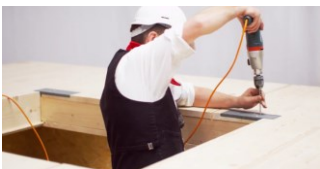
Large framing with trimmer and steel plates



Static system steel plate



- Trimming, structural reinforcement, trimmer and steel plates are already prepared in the factory.
- Insert the trimmer in the trimmed element and already mount the possible steel plate.
- Structurally connect the trimmer to the element.



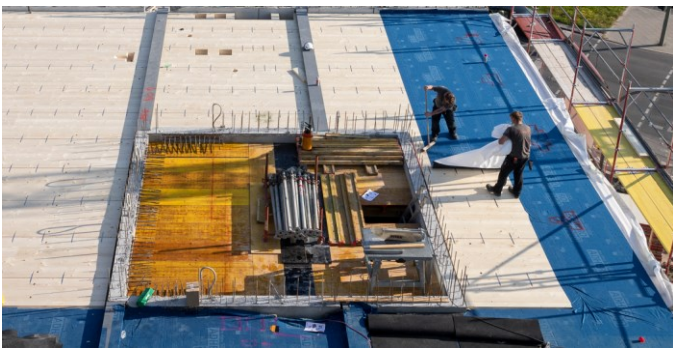
- Place the trimmed element between the two load-bearing elements.
- Push the elements into position
- Mount the missing steel plate and attach further structural connections.

Weather protection

Potection during the construction period



- On flat roofs, the use of the suitable vapour barrier takes over the emergency sealing. The installation must be carried out according to the manufacturer's instructions and taking into account swelling shrinkage in the joint transition.



- Self-adhesive weather protection membranes such as SIGA Wetguard, Isocell Timber Protect or Proclima Solitex Adhero are suitable as for reliable moisture protection and trickle protection. The installation of the temporary covering membrane must be carried out according to the manufacturer's instructions. The on-site application of the weather protection membrane offers the advantage that danger spots such as joints, openings, fasteners, ... can be identified and sealed directly on site. We do not offer factory pre-assembly of the weather protection membrane. Experienced carpenters report us that on-site assembly without factory pre-assembly is more efficient, more cost-effective and less prone to errors.

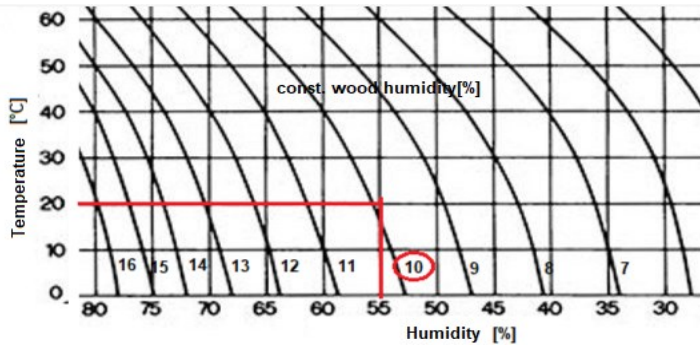


- Temporary cover fixed according to processing guidelines, incl. emergency drains, joints overlapped and glued. The weather protection is connected in a rainproof manner all around, across all trades and at penetrations with system products, the fasteners are sealed.



- The temporary cover is to be laid immediately after the wooden construction has been erected, at the end of each working day. The emergency drains must be designed in such a way that the rainwater can flow out of the area without backing up. The positioning of the emergency drains must be agreed with the site management.

Wood moisture Lignatur



- LIGNATUR elements must be installed dry immediately upon delivery or protected from moisture during storage on the construction site. The elements are manufactured with a moisture content of 10+/-2 %. This corresponds to a moisture content that occurs in a room climate of 20 °C and 55 % relative humidity. Source: Keylwerth - Diagram.

Protection from building moisture



- An unacceptable increase in humidity of LIGNATUR elements as a result of high building humidity (direct effect of humidity or indirect effect of high relative humidity) must be prevented during all construction phases. The indoor climate has to be checked continuously and rooms with high building moisture have to be ventilated or dehumidified until the higher building moisture has decreased. A climate with a temperature between 10 °C and 25 °C and a relative humidity between 65 % and 40 % is ideal.

Beware of drying out too quickly:



- Continuous monitoring of the air humidity is necessary to guarantee slow, damage-free re-drying. When using drying and heating tools, care must be taken to avoid too rapid re-drying. Different wood moisture contents on the upper and lower side of the element can be the result of too fast re-drying. This can lead to unsightly stress cracks in the visible surface.